2011-05-12

How Weapon Systems are Like Jelly Beans : Prediction Markets as an Information Aggregation Tool for Effective Project Management in Defense Acquisition Projects

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Prediction Markets as Information Aggregation Tool for Effective Project Management in Defense Acquisition Projects

May 12, 2011

NPS

Monterey, CA

Prof. Matt Potoski
Iowa State University

Dr. Ricardo Valerdi
MIT

Taroon Agarwal
MIT

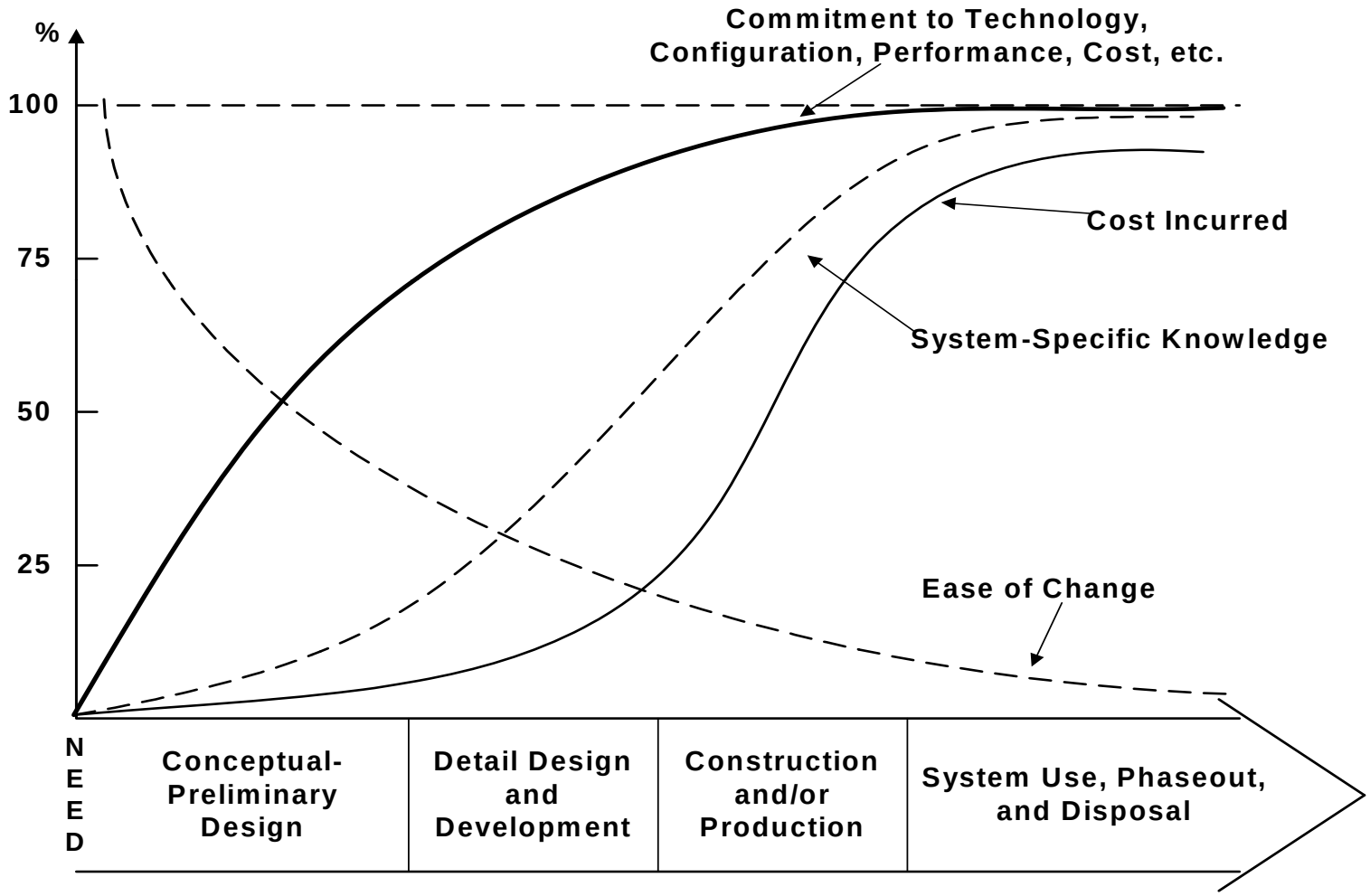
Acknowledgements

- Research supported by the Acquisition Research Program in the Graduate School of Business and Public Policy, Naval Postgraduate School.

- Special thanks to MITRE for extending their support and time, and for providing some useful information on prediction markets.

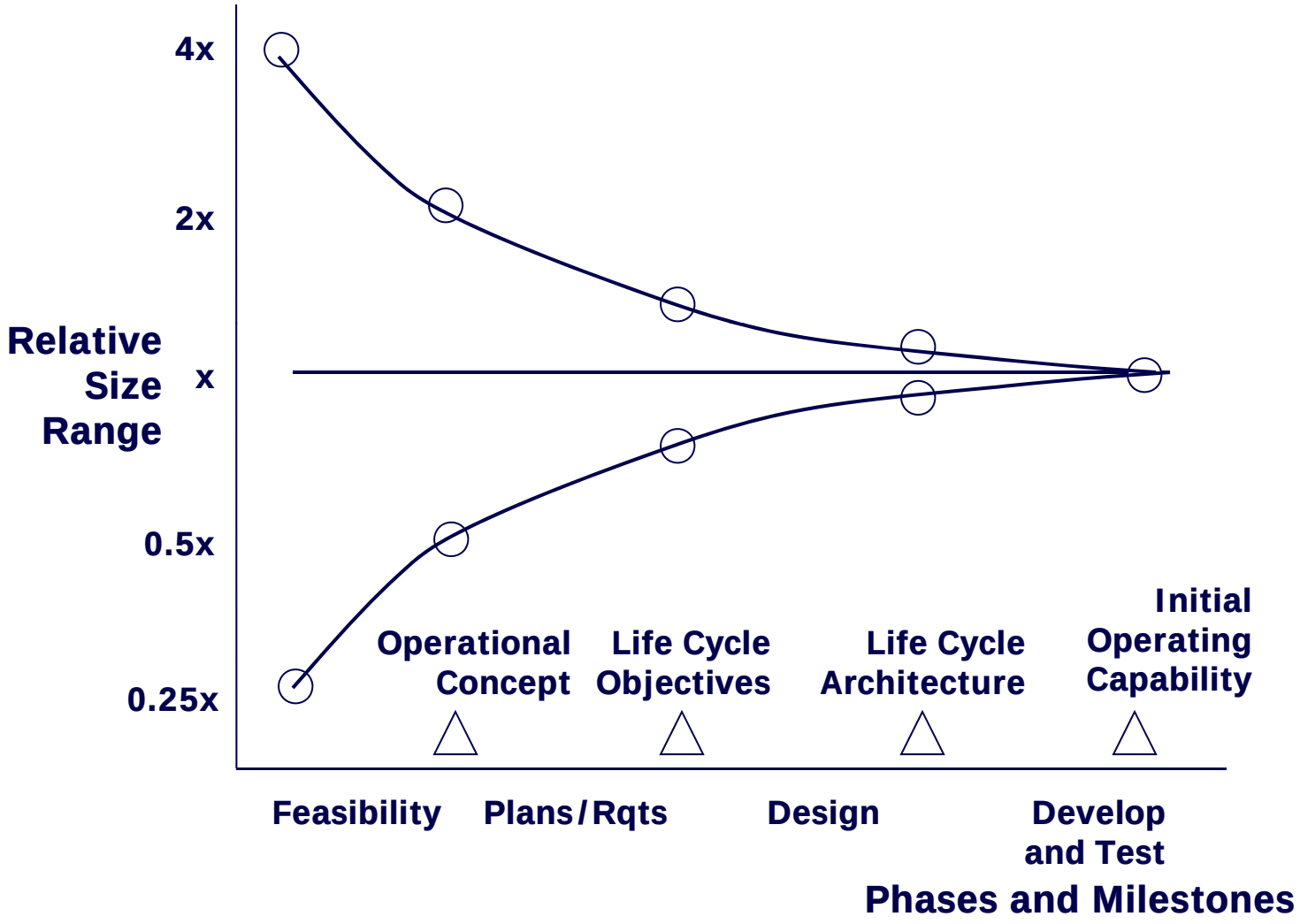
- We wish to thank Adam Siegel of Inkling Markets for his suggestions on prediction market design.

Cost Commitment on Projects



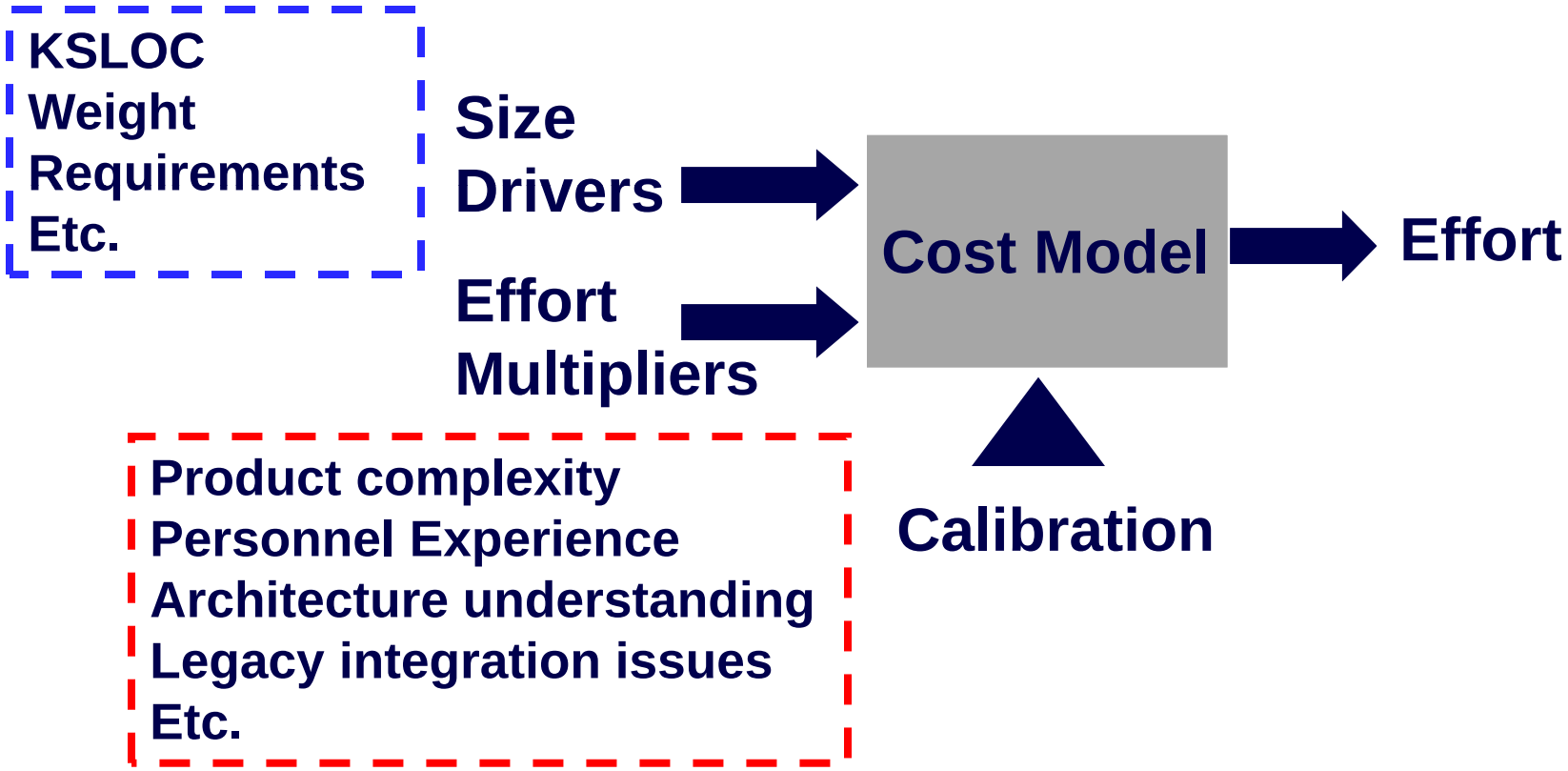
Blanchard, B., Fabrycky, W., *Systems Engineering & Analysis*, Prentice Hall, 1998.

Cone of Uncertainty

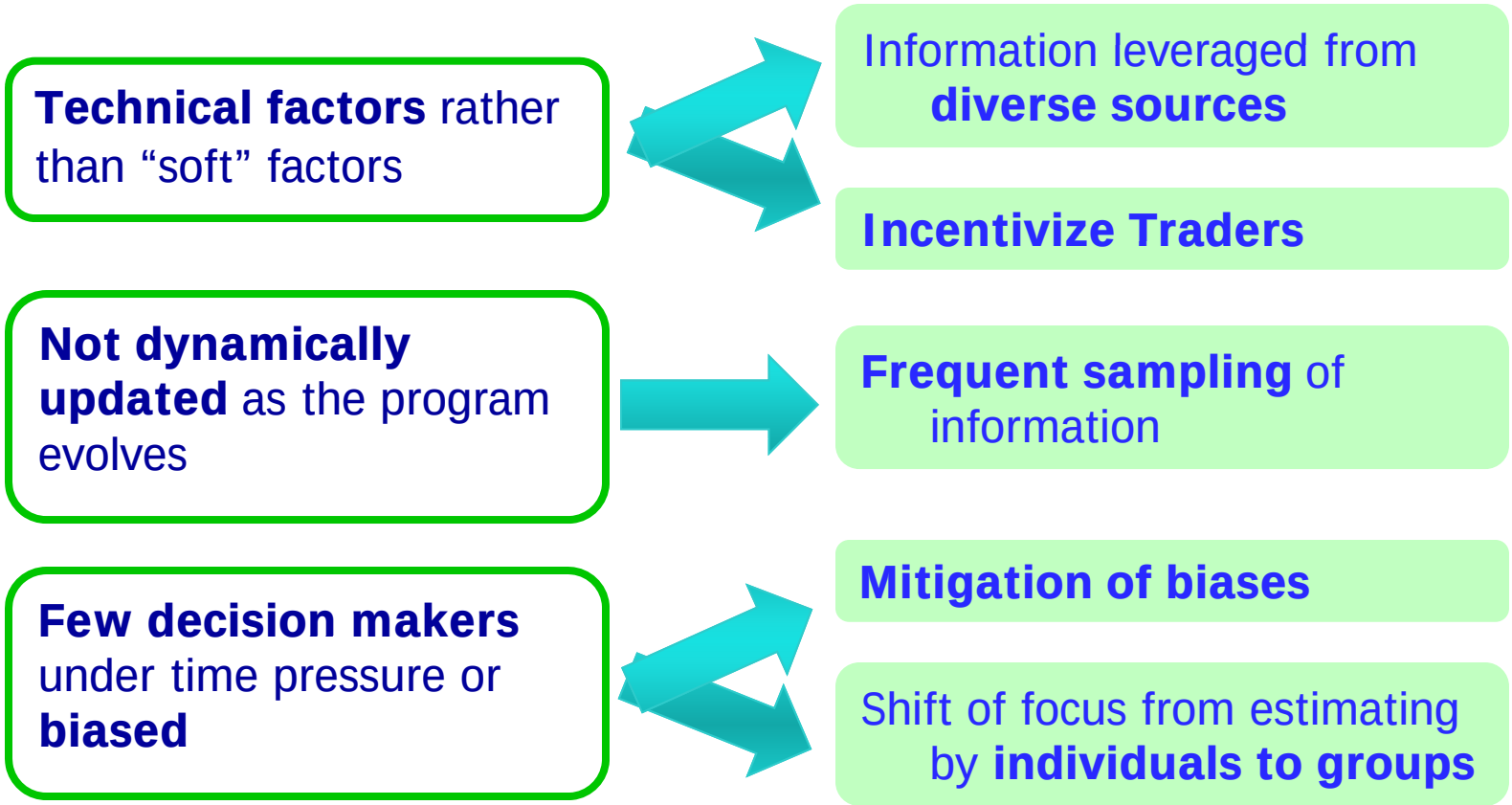


Source: Barry Boehm (USC)

How Cost Modeling is Done Today

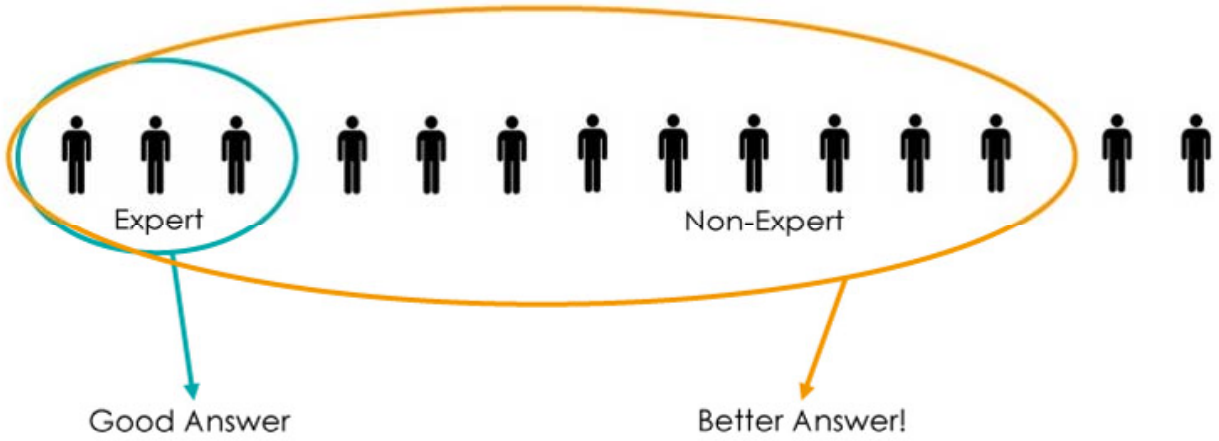


Prediction Markets: Value Proposition



Prediction Markets

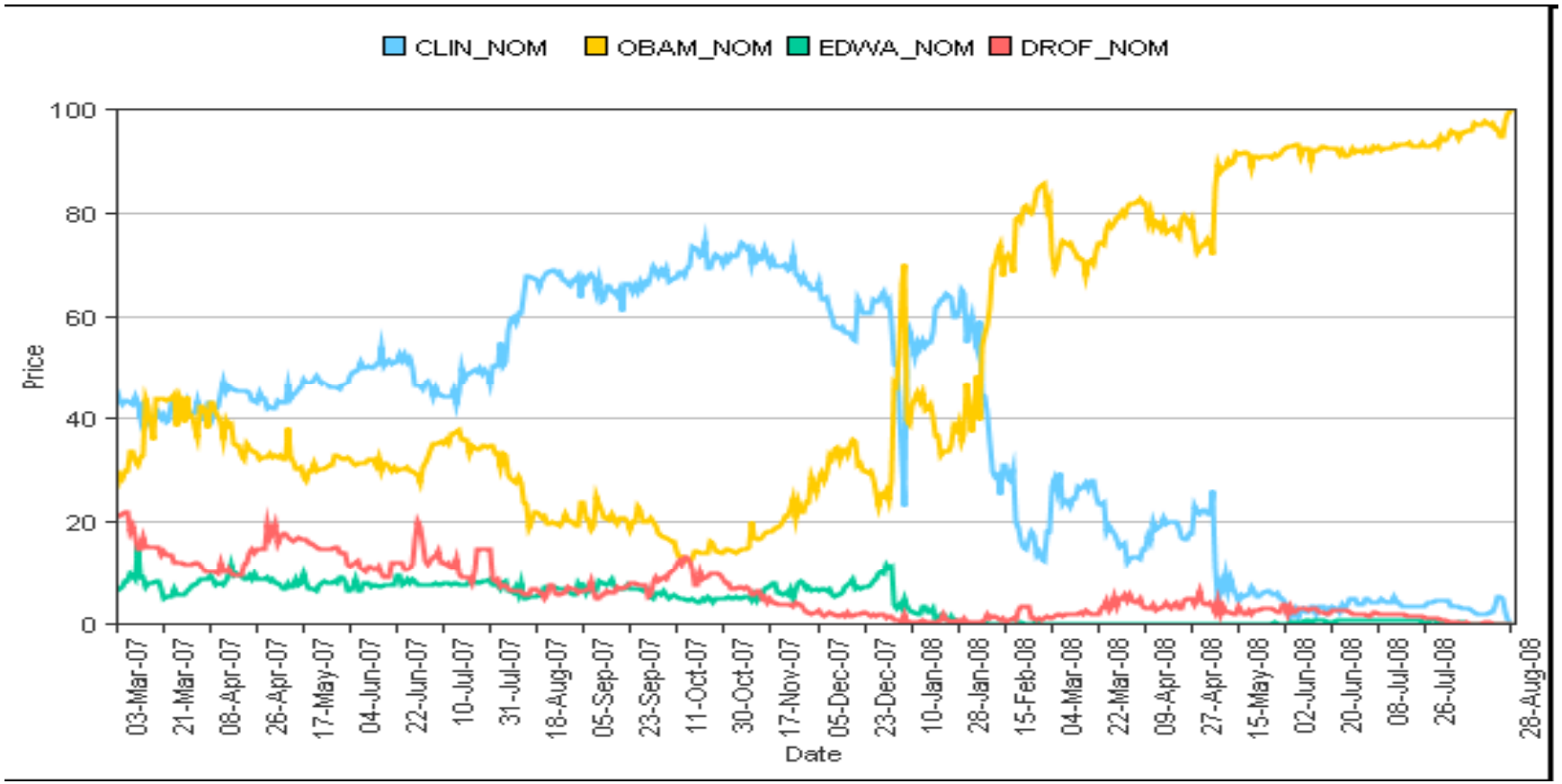
- A place where people can buy and sell contracts that pay the owner based on some future event



Example

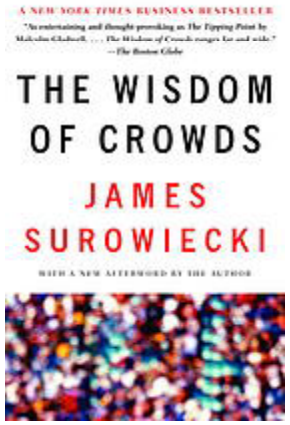
- Iowa Electronic Markets: 2008 Presidential Election
  - Buy and sell shares of candidate votes
  - Contract pays $0.01 for each percentage point of Obama's vote
  - Contract pays $1.00 if Obama wins

2008 Democratic Nomination Race

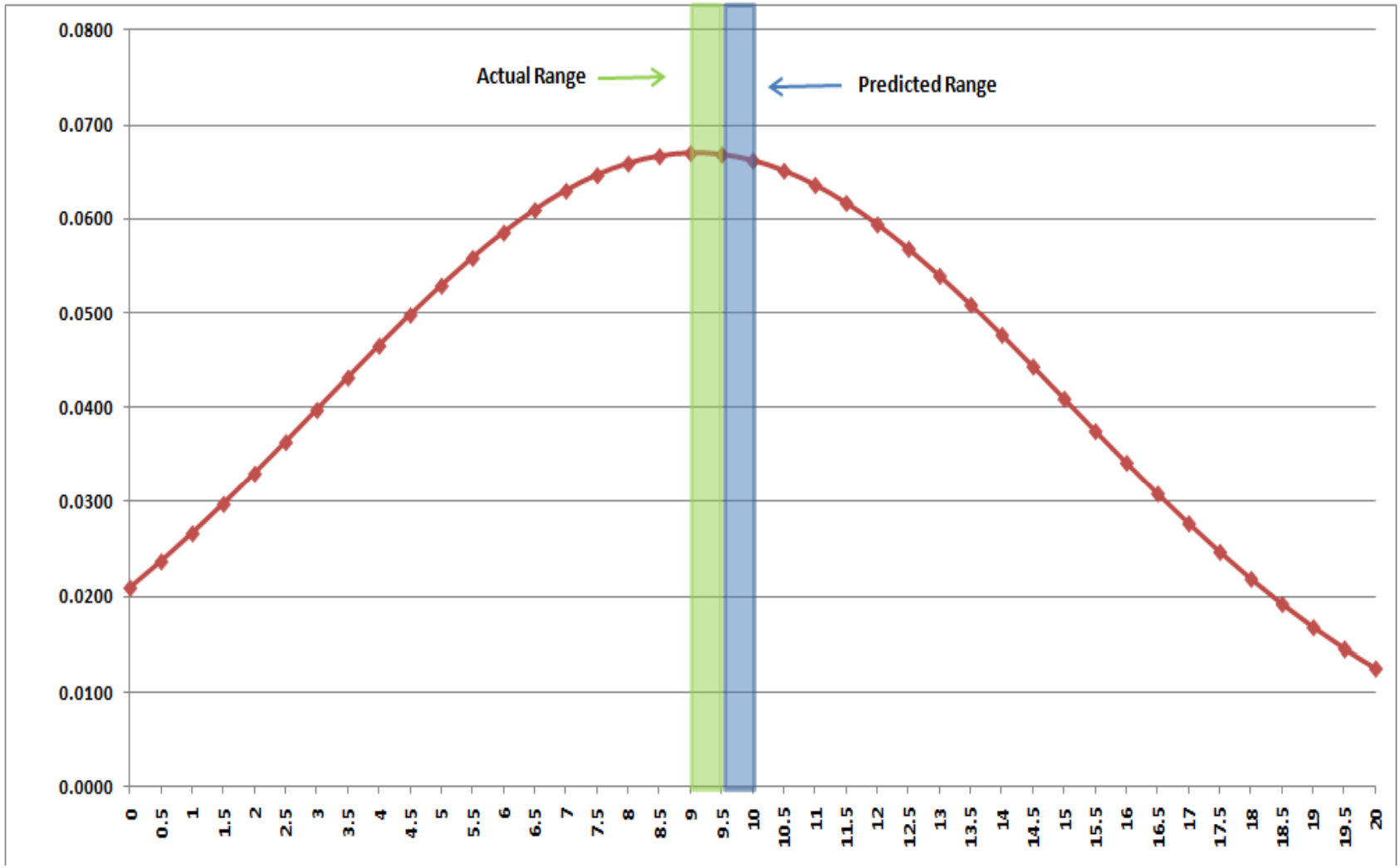


Hypothesis: prediction markets are "efficient markets"

- Market prediction summarizes traders' beliefs about what will occur in future
  - Truthful revelation: biased trading gets counter traded (e.g., political trading markets)
  - Information discovery: informed trading is rewarded
- Crowds can be "wise"
  - Diversity, independence, decentralization, aggregation



Example: Nielsen ratings for Monday night football



% of 115.9 million television households in the United States

The Case for Prediction Markets

- "First order effects": information aggregation for accurate prediction
  - Mechanism for bringing together information
  - Incentives for searching out information
  - Incentives for revealing information

The Case for Prediction Markets

- "Second order effects": organization culture and communication
  - Signal topics of interest
  - Promote interest and engagement in topics
  - "Flatten" hierarchy
  - Invigorate culture

Questions PM's can answer: practical guidelines

- "Contractible": can write a contract about future events with unambiguous and verifiable outcomes

- Outcome categories are mutually exclusive and exhaustive

Types of Questions

- Bad: “Sales of Xbox consoles will exceed expectations by the end of the year.”

- Good: “How many Xbox consoles will be sold between November 1 and December 31, 2010?”

Using Prediction Markets: Early Lessons

- Problem: “I don’t know how to run a prediction market; it seems hard”

- Remedy:
  - Use Inkling software: www.inklingmarkets.com
  - Market makers are key

Using Prediction Markets: Early Lessons

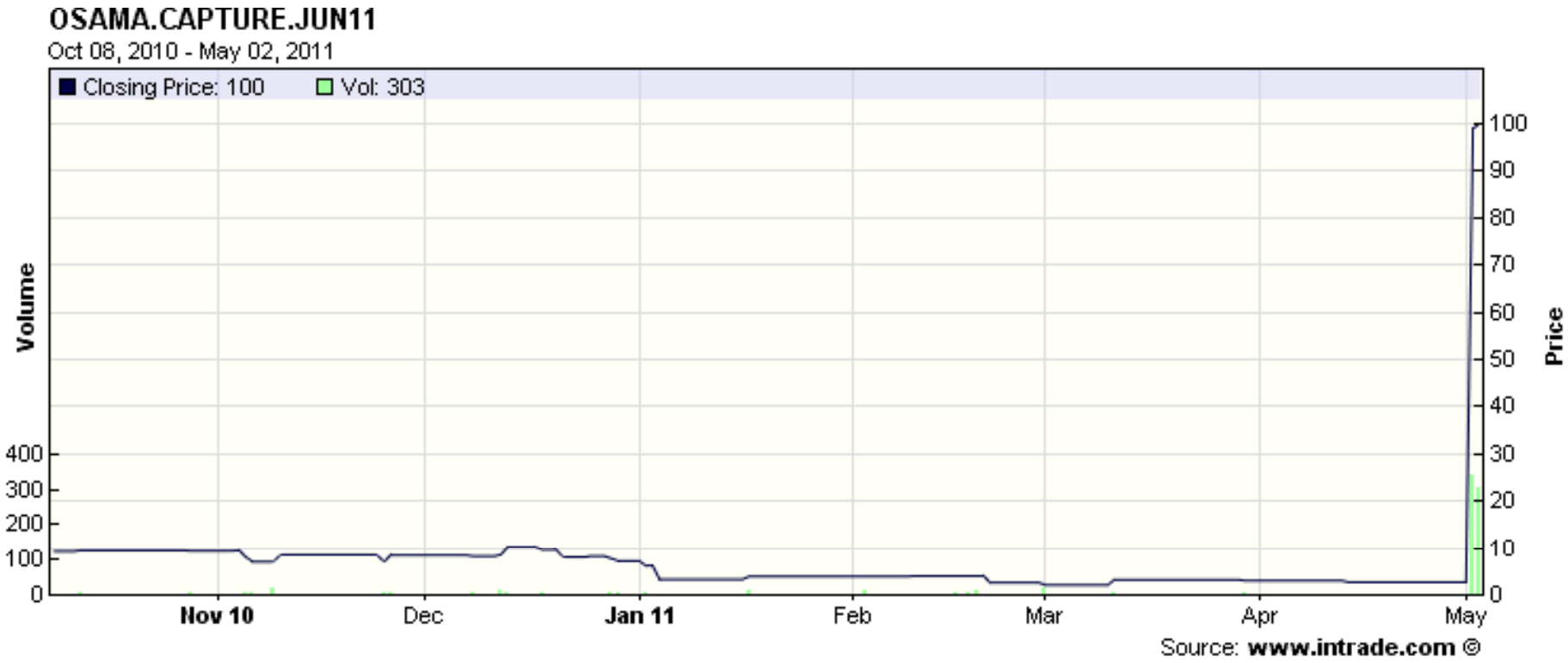
- Problem: “Liquidity”: not enough trades and traders

- Remedies:
  - Incentives:
    - Prizes
    - Recognition
  - “Hard” and “Fun” questions
  - Newsletters
  - Senior management involvement

Using Prediction Markets: Early Lessons

- Problem: “Insider trading”
  - Some traders have/will have inside information
- Remedies:
  - Change questions
  - Change trading window
  - Restrict trading access to “insiders”

Osama Bin Laden to be captured / neutralized before midnight ET on 30 Jun 2011



Prediction Markets: Case Study - SWCS

Design Components to consider

- **Stocks**
- **Marketplace**
- **Traders**

Shallow Water Combat Submersible

Implement prediction markets to surface potential program risks, and generate cost/schedule estimates as a supplement to existing estimation methodologies

Prediction Markets: Benefits to SWCS

Benefit from the prediction markets event forecasts.

Increased involvement of the participants in anticipating events.

Identifying informal information channels in their organization.

Continuous review of factors impacting cost and schedule

Agility | Efficiency | Transparency

Prediction Market Design

First Order Questions: Program of interest

- Will SWCS be certified by August 1, 2012?
- The cost of the first unit will be $x.

Second Order Questions: Traders and the trading process

- Who has information about the program (who makes money in the market?)
- Where did they learn this information?
- What is your motivation for trading? (e.g. to win/to solve the problem/to validate my knowledge)

Third Order Questions: Behavior outside the markets

- Did prediction market participation increase team knowledge, collaboration and information sharing?
- Did it outperform a cost model in terms of agility, transparency, sensitivity to events?

Prediction Market Design Principles

Sufficiently broad following

Incentives based on constant participation and ability to predict accurate results

Ample historical data

Mix of hard and fun questions

Anonymity of participants, information security/confidentiality